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(54) Title: A METHOD AND AN APPARATUS FOR FORMING A BOX

(54) Titre: PROCEDE ET DISPOSITIF DE FORMATION D'UNE BOITE

(57) Abstract

A method and an apparatus for forming a box is disclosed. The first step of the method is to form a blank into a partially-erected box that has a base (3'), upright side walls (5'), upright end walls (7'), gusset corners (9') that are outside the interior of the box and side flaps (11') or end flaps (15') that extend upwardly from the side walls (5') or the end walls (7'). Adhesive material is then applied to the outer surface of the side walls (5') or the end walls (7') and the side flaps (11') or the end flaps (15') are folded outwardly and downwardly so that the gusset corners (9') are sandwiched between the folded down side flaps (11') and the side walls (5') or between the folded down end flaps (15') and the end walls (7').

(57) Abrégé

L'invention concerne un procédé et un dispositif de formation d'une boîte. La première étape de ce procédé consiste à former une découpe dans une boîte partiellement érigée et qui présente une base (3'), des parois latérales verticales (5'), des parois d'extrémité verticales (7'), des soufflets latéraux (9') situés à l'extérieur de la boîte, ainsi que des volets latéraux (11') ou volets d'extrémité (15') s'étendant vers le haut à partir des parois latérales (5') ou des parois d'extrémité (7'). Le procédé consiste ensuite à appliquer un matériau adhésif sur la surface extérieure des parois latérales (5') ou des parois d'extrémité (7'), et à replier les volets latéraux (11') ou volets d'extrémité (15') vers l'extérieur et vers le bas, de façon que les soufflets (9') soient pris en sandwich entre les volets latéraux pliés vers le bas (11') et les parois latérales (5'), ou entre les volets d'extrémité pliés vers le bas (15') et les parois d'extrémité (7').

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(54) Title: A METHOD AND AN APPARATUS FOR FORMING A BOX	
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(57) Abstract

A method and an apparatus for forming a box is disclosed. The first step of the method is to form a blank into a partially-erected box that has a base (3'), upright side walls (5'), upright end walls (7'), gusset corners (9') that are outside the interior of the box and side flaps (11') or end flaps (15') that extend upwardly from the side walls (5') or the end walls (7'). Adhesive material is then applied to the outer surface of the side walls (5') or the end walls (7') and the side flaps (11') or the end flaps (15') are folded outwardly and downwardly so that the gusset corners (9') are sandwiched between the folded down side flaps (11') and the side walls (5') or between the folded down end flaps (15') and the end walls (7').

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Description

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A METHOD AND AN APPARATUS FOR FORMING A BOX

10 The present invention relates to a method and an apparatus for forming a box.

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15 The present invention relates particularly, although by no means exclusively, to a method and an apparatus for forming a box having a base, upright side walls and end walls, gusset corners that are folded against outer surfaces of the side walls or the end walls, and outwardly folded side flaps and end flaps that are adhered to the side walls and end walls and retain the gusset corners in position.

20 15 The above-described box is suited particularly for use in the production of baked food products, such as cakes.

25 30 In this context, the present invention also relates to a method of producing a food product which includes the steps of forming the above-described box, placing a food product mix in the box, and then baking the food product in the box.

35 25 One known and widely used method of forming a box from a blank is based on applying glue to appropriate panels of the blank and then folding the blank to erect the box and to glue together overlapping panels which hold together the erected box.

30

40 45 35 This method is not well suited to making boxes that have outwardly folded gusset corners. Gusset corners are important in constructing leak-proof boxes. Outwardly folded gusset corners are important in situations where unhindered access to the interior of a box is required. One such situation is the manufacture of baked food products.

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Another known but less widely used method of forming a box from a blank is based on folding a blank to erect the box and using mechanical interlocks formed in the blank to retain the corners in position and thereby hold 5 together the erected box.

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This method is also not well suited to making boxes that have outwardly facing gusset corners. In particular, the method is not well suited to making such 10 boxes at high rates of production.

20

An object of the present invention is to provide an improved method and apparatus for forming a box with outwardly folded gusset corners.

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According to the present invention there is provided a method of forming a box from a blank, which method includes the steps of:

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20 (a) forming the blank into a partially-erected box having a base, upright side walls, upright end walls, gusset corners that are outside the interior of the box, side flaps that extend upwardly from the side walls and/or end flaps that extend upwardly from the end walls;

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30 (b) applying an adhesive material to the partially-erected box;

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(c) outwardly and downwardly folding the side flaps against the side walls or outwardly and downwardly folding the end flaps against the end walls so that:

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35 (i) the gusset corners are sandwiched between the folded down side flaps and

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the side walls or between the folded down end flaps and the end walls; and

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(ii) the folded down side flaps are adhered to the side walls or the folded down end flaps are adhered to the end walls.

15

Preferably the blank includes a series of panels separated by fold lines and step (a) includes folding the blank about the fold lines so that the panels form the base, the side walls, the end walls, the gusset corners, the side flaps and/or the end flaps.

20

Each gusset corner may be formed from any suitable number of adjacent panels.

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Preferably each gusset corner is formed from two adjacent panels.

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Step (a) may be carried out with any suitable means.

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Preferably step (a) includes forcing the blank into a forming chamber and thereby causing the blank to fold about the fold lines.

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The adhesive material may be any suitable adhesive material.

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Suitable adhesive materials include glue and double-sided adhesive tape.

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According to the present invention there is also provided a method of producing a food product which includes the steps of:

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(a) forming a box as described above;

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(b) placing a food product mix in the box; and

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15(c) baking the food product in the box in an
oven.

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According to the present invention there is also
provided an apparatus for forming a box from a blank which
includes:

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(a) a box forming station for forming the blank
into a partially-erected box having a base,
upright side walls, upright end walls, gusset
corners outside the interior of the box, side
flaps extending upwardly from the side walls
and/or end flaps extending upwardly from the
end walls;

20

(b) an adhesive material application station for
applying an adhesive material to the
partially-erected box; and

25

(c) a flap folding station for outwardly and
downwardly folding the side flaps against the
side walls or for outwardly and downwardly
folding the end flaps against the end walls
so that:

30

(i) the gusset corners are sandwiched
between the folded down side flaps and
the side walls or between the folded
down end flaps and the end walls; and

35

(ii) the folded down side flaps are adhered
to the side walls or the folded down
end flaps are adhered to the end walls.

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It is preferred that the apparatus includes a transfer means for moving the blank to the box forming station and then moving the partially-erected box successively to the adhesive material application and flap 5 folding stations.

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It is preferred that the apparatus further includes a means for contacting the upwardly extending side flaps or the upwardly extending end flaps as the partially-erected box leaves the box forming station and outwardly 10 folding the side or end flaps.

20

It is preferred that the flap forming station includes an assembly for folding each flap.

25

It is preferred that each assembly includes an inner downwardly extending member, an outer downwardly extending member, a means which couples together upper sections of the members so that the outer member can swing 30 about the coupling outwardly and inwardly relative to the inner member, and a means for moving:

35

(a) the members downwardly towards and upwardly away from the box at the station; and

(b) the outer member outwardly and inwardly relative to the inner member.

40

In use of the above-described assembly, when a 30 partially-erected box with upwardly extending side or end flaps is at the flap-forming station, each assembly:

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(a) initially moves downwardly to a position at which the outer member is located inwardly of 35 one of the side flaps or the end flaps;

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(b) the outer member then swings outwardly in a

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flicking motion and contacts and folds the side flap or the end flap outwardly;

10

5 (c) simultaneously with step (b) the assembly moves downwardly and the outer member folds the side flap or the end flap downwardly and positions the downwardly-facing side flap or end flap between the outer and inner members; and

15

10

20 (d) as the assembly continues to move downwardly, the outer member swings inwardly and forces the side flap or the end flap against one of the side walls or the end walls.

15

25 The present invention is described further by way of example with reference to the accompanying drawings, of which:

30

20 Figure 1 is a top plan view of a blank for forming a box in accordance with a preferred embodiment of the method and the apparatus of the present invention;

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25 Figure 2 is a perspective view of a partially-erected box formed from the blank shown in Figure 1 at a box forming station of the apparatus;

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30 Figure 3 is a perspective view of the finished box as produced in a flap forming station of the apparatus; and

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Figure 4 illustrates the sequence of steps carried out at the flap forming station.

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35 The blank shown in Figure 1 includes a series of panels separated by fold lines.

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- 7 -

10 The preferred embodiment of the method of the present invention folds and glues the panels of the blank and forms the finished box shown in Figure 3.

15 5 The panels in Figure 1 are marked with reference numerals. When folded to form the finished box shown in Figure 3, the panel 3 shown in Figure 1 forms the base 3', the panels 5 form the side walls 5', the panels 7 form the end walls 7', the pairs of adjacent panels 9 form the 20 outwardly facing gusset corners 9', the panels 11 form the outwardly and downwardly facing side flaps 11', and the panels 15 form the outwardly and downwardly facing end flaps 15'.

25 15 The blank is formed from corrugated board with a bleached lining on the surfaces that form the interior of the box and a polyolefin facing on the bleached lining. The purpose of the polyolefin lining is to provide a barrier to water and oil. This treated corrugated board is 30 20 particularly suitable for the production of baked food products and the preferred embodiment is described in this context. The blank may be formed from any other suitable material.

35 25 In the finished box shown in Figure 3 the gusset corners 9' are outwardly facing and are sandwiched between the side flaps 11' and the side walls 5'. It can readily 40 30 be appreciated that an alternative arrangement is one in which the outwardly facing gusset corners are sandwiched between the end flaps 15' and the end walls 7'.

45 35 The first step of the preferred embodiment of the method for forming the box shown in Figure 3 from the blank shown in Figure 1 is to fold the panels 15 through 180° to 50 35 contact the panels 7 and to glue together the panels 7, 15. In effect, this step pre-forms what will become the outwardly and downwardly facing end flaps 15' of the

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finished box.

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The blank is then folded and glued by a box forming apparatus and thereby formed into the box shown in 5 Figure 3. The apparatus includes a series of stations at which the blank is successively folded and glued to form the box.

15

The blank is positioned first at an inlet end of 10 the apparatus and is transported by means of a pneumatic ram along a horizontal slide to a box-erecting station and 20 is positioned to extend horizontally across an open forming chamber. A forming member, such as a punch, then moves 15 downwardly and contacts the blank and forces the blank into the forming chamber and thereby partially erects the box 25 with the side walls 5', the end walls 7', and the gusset corner 9' folded against the side walls 5'. In this partially erected state the side flaps 11' extend upwardly 30 from the side walls 5'.

20

The partially erected box is then moved by means 35 of a second pneumatic ram through a gluing station (not shown) and glue is applied to the side walls 5' as the side walls 5' move past fixed gluing guns (not shown). The 25 applied glue is illustrated by the numeral 21 in Figure 2. The glue includes hot melt glue and cold glue. In an alternative arrangement the partially-erected box is 40 stationary at the gluing station and the glue guns move past the stationary box.

30

The glued, partially-erected box is then moved by 45 the second pneumatic ram to a side flap folding station and a flap folding assembly on each side of the box moves down and folds the side flaps 11' outwardly and downwardly 35 against the side walls 5' and sandwiches the corner gussets 9' between the side flaps 11' and the side walls 5'. Whilst at the side flap folding station the hot melt glue 50

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provides an initial tack weld to hold the side flaps against the side walls. Progressively, the cold glue sets and provides a full strength bond. The use of a combination of hot melt glue and cold glue is particularly suited to baking food products.

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The formed box is discharged from an outlet end of the box forming apparatus.

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10 The above-described box forming apparatus also includes an indexing means which controls movement of blanks through the apparatus.

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15 With reference to Figure 4, the assembly (shown in very diagrammatic form) on each side of the box includes an inner and an outer flap-folding member in the form of plates 17a, 17b which are coupled together at upper sections of the plates.

30

20 Figure 4 illustrates the operation of the assembly to fold the side flap 11' shown in the Figure outwardly and downwardly against the side wall 5' shown in the Figure. Firstly, with reference to the left hand sketch, the assembly moves downwardly to a position at 35 which the outer member 17a is located inwardly of the side flap 11'. Secondly, the outer member 17a swings outwardly in a flicking motion and contacts and folds outwardly the side flap 11'. Simultaneously, the assembly moves 40 downwardly and the outer member 17a folds the side flap 11' downwardly. Finally, as the assembly continues to move 45 downwardly, the outer member 17a swings inwardly and forces the side flap 11' towards and ultimately against the side wall 5' and holds it in this position for a sufficient time for the hot glue to establish a tack weld. In this 50 sequence of steps the inner member 17b acts as a reaction surface against which the side flap 11' is folded.

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- 10 -

When the completed box is used in the production of baked food products, the box is then moved to a food product line and food product mix is placed in the box and the box is transported to an oven (typically a convection oven) and the product is baked in the box.

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Any modifications may be made to the preferred embodiment described above without departing from the spirit and scope of the present invention.

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Claims

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CLAIMS

10 1. A method of forming a box from a blank,
which method includes the steps of:

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15 (a) forming the blank into a partially-erected
box having a base, upright side walls,
upright end walls, gusset corners that are
outside the interior of the box, side flaps
10 that extend upwardly from the side walls
and/or end flaps that extend upwardly from
20 the end walls;

25

15 (b) applying an adhesive material to the
partially-erected box;

25 (c) outwardly and downwardly folding the side
flaps against the side walls or outwardly and
downwardly folding the end flaps against the
30 end walls so that:

35 (i) the gusset corners are sandwiched
between the folded down side flaps
and the side walls or between the
folded down end flaps and the end
25 walls; and

40 (ii) the folded down side flaps are
adhered to the side walls or the
30 folded down end flaps are adhered to
the end walls.

45 2. The method defined in claim 1 wherein the blank
includes a series of panels separated by fold lines and
35 step (a) includes folding the blank about the fold lines so
that the panels form the base, the side walls, the end
50 walls, the gusset corners, the side flaps and/or the end

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flaps.

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3. The method defined in claim 2 includes forming each gusset corner from two adjacent panels.

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4. The method defined in claim 2 or claim 3 wherein step (a) includes forcing the blank into a forming chamber and thereby causing the blank to fold about the fold lines and form the partially-erected box with the base, upright side walls, upright end walls, gusset corners that are outside the interior of the box, and side and/or end flaps that extend upwardly from the side and/or end walls.

20

5. The method defined in any one of the preceding claims wherein step (c) includes outwardly folding the side and/or end flaps by contacting the side and/or end flaps with flap folding members that swing outwardly in a flicking motion and contact and fold outwardly the side and/or end flaps.

30

6. The method defined in claim 5 further includes downwardly folding the side and/or end flaps by moving the flap folding members downwardly at the same time as the members move outwardly in the flicking motion, with the downward movement of the flap folding members causing the side and/or end flaps to fold downwardly against the side and/or end walls.

40

7. A method of producing a food product which includes the steps of:

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(a) forming a box in accordance with the method defined in any one of the preceding claims;

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(b) placing a food product mix in the box; and

(c) baking the food product in the box in an

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oven.

10 8. An apparatus for forming a box from a blank which
includes:

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15 (a) a box forming station for forming the blank
10 into a partially-erected box having a base,
upright side walls, upright end walls,
gusset corners outside the interior of the
20 box, side flaps extending upwardly from the
side walls and/or end flaps extending
upwardly from the end walls;

15

25 (b) an adhesive material application station for
applying an adhesive material to the
partially-erected box; and

30

20 (c) a flap folding station for outwardly and
downwardly folding the side flaps against
the side walls or for outwardly and
downwardly folding the end flaps against the
end walls so that:

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35 (i) the gusset corners are sandwiched
25 between the folded down side flaps
and the side walls or between the
folded down end flaps and the end
walls; and

40

30

30 (ii) the folded down side flaps are
45 adhered to the side walls or the
folded down end flaps are adhered to
the end walls.

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35 9. The apparatus defined in claim 8 includes a
transfer means for moving the blank to the box forming
station and then moving the partially-erected box

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successively to the adhesive material application and flap folding stations.

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10. The apparatus defined in claim 9 further includes a means for contacting the upwardly extending side flaps or the upwardly extending end flaps and outwardly folding the side or end flaps as the partially-erected box is moved by the transfer means from the box forming station.

15

10 11. The apparatus defined in any one of claims 8 to 10 wherein the flap forming station includes an assembly 20 for folding each flap.

20

12. The apparatus defined in claim 9 wherein each 15 assembly includes an inner downwardly extending member, an outer downwardly extending member, a means which couples 25 together upper sections of the members so that the outer member can swing about the coupling outwardly and inwardly relative to the inner member, and a means:

30

20 (a) for moving the members downwardly towards and upwardly away from the box at the station; and

35

25 (b) for moving the outer member outwardly and inwardly relative to the inner member;

40

whereby in use of the assembly, when a partially-erected 30 box with upwardly extending side or end flaps is at the flap-forming station, each assembly:

45

35 (a) initially moves downwardly to a position at which the outer member is located inwardly of one of the side flaps or the end flaps;

50

35 (b) the outer member then swings outwardly in a flicking motion and contacts and folds the

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side flap or the end flap outwardly;

10

5 (c) simultaneously with step (b) the assembly moves downwardly and the outer member folds the side flap or the end flap downwardly and positions the downwardly-facing side flap or end flap between the outer and inner members; and

15

10 (d) as the assembly continues to move downwardly, the outer member swings inwardly and forces the side flap or the end flap against one of the side walls or the end walls.

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15 13. A method of forming a box from a blank substantially as hereinbefore described with reference to the accompanying drawings.

25

20 14. An apparatus for forming a box from a blank substantially as hereinbefore described with reference to the accompanying drawings.

35

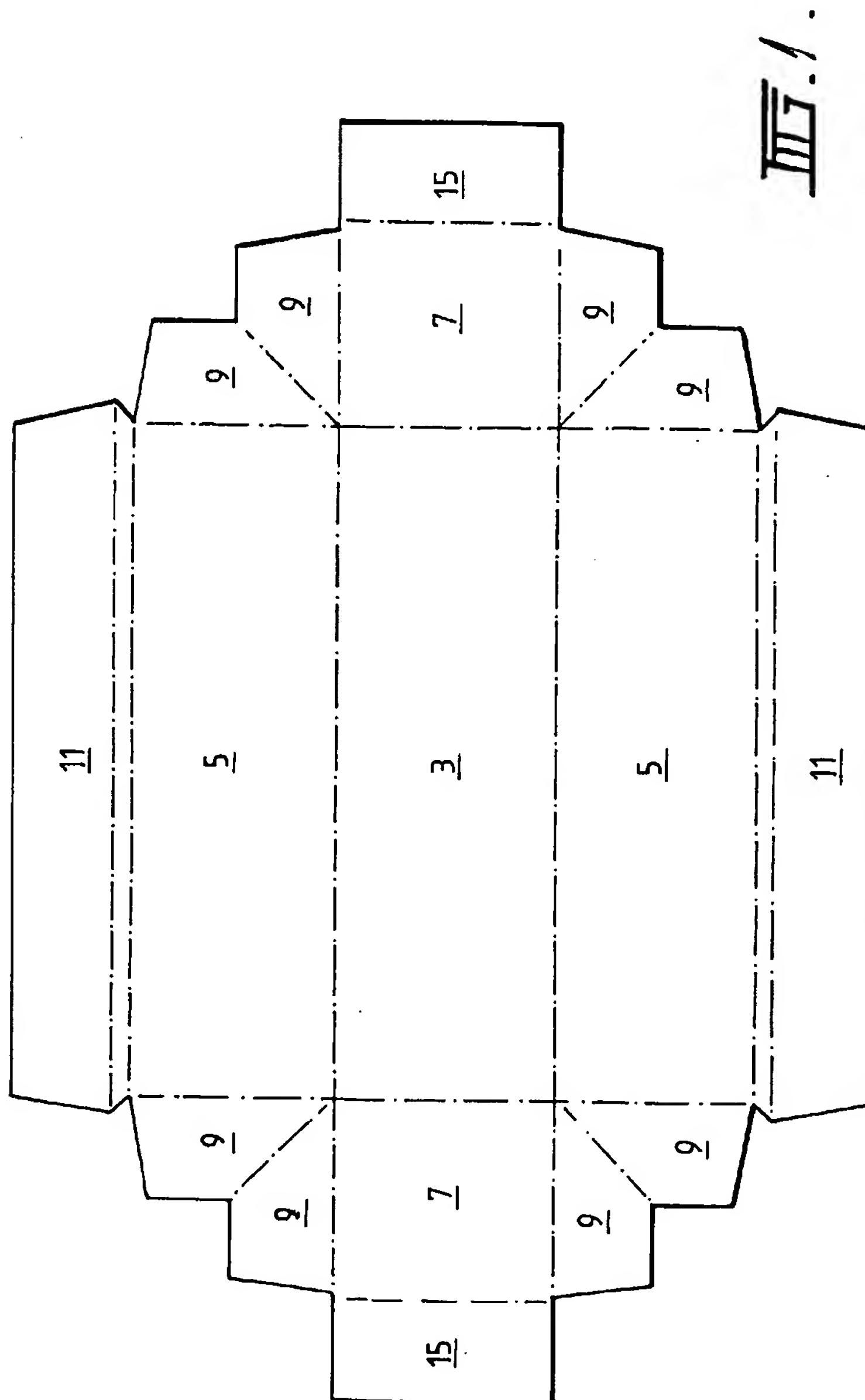
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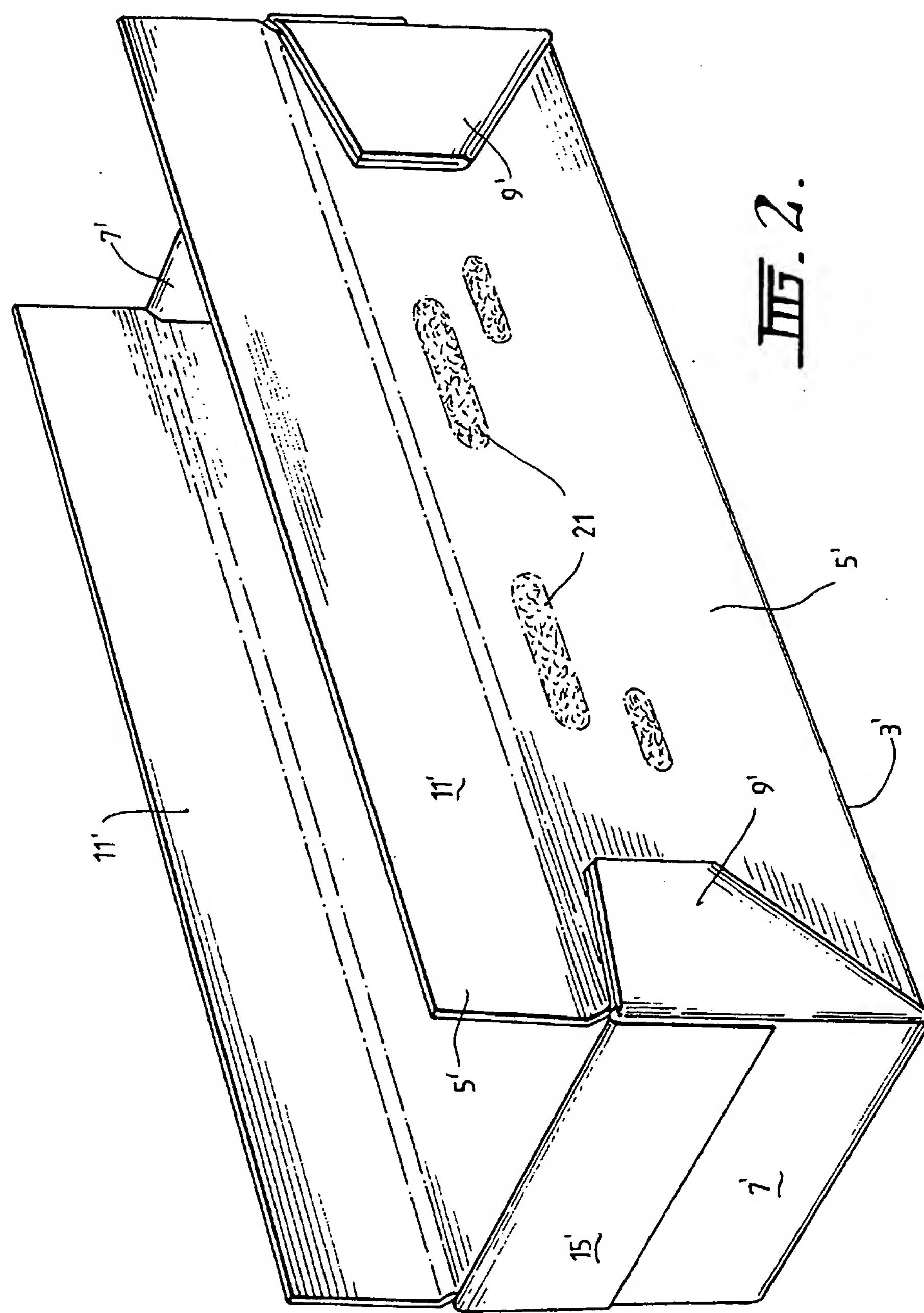
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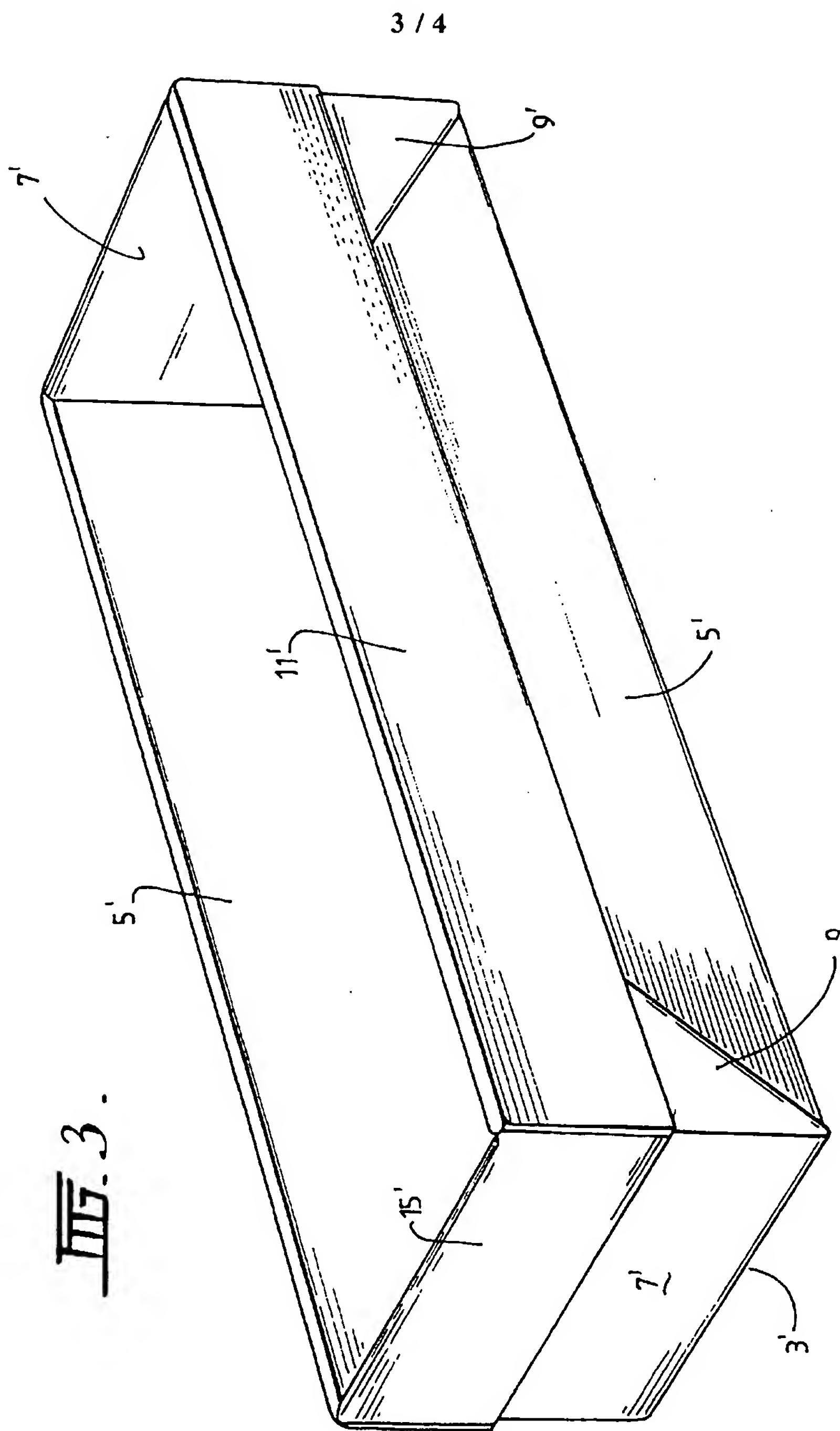
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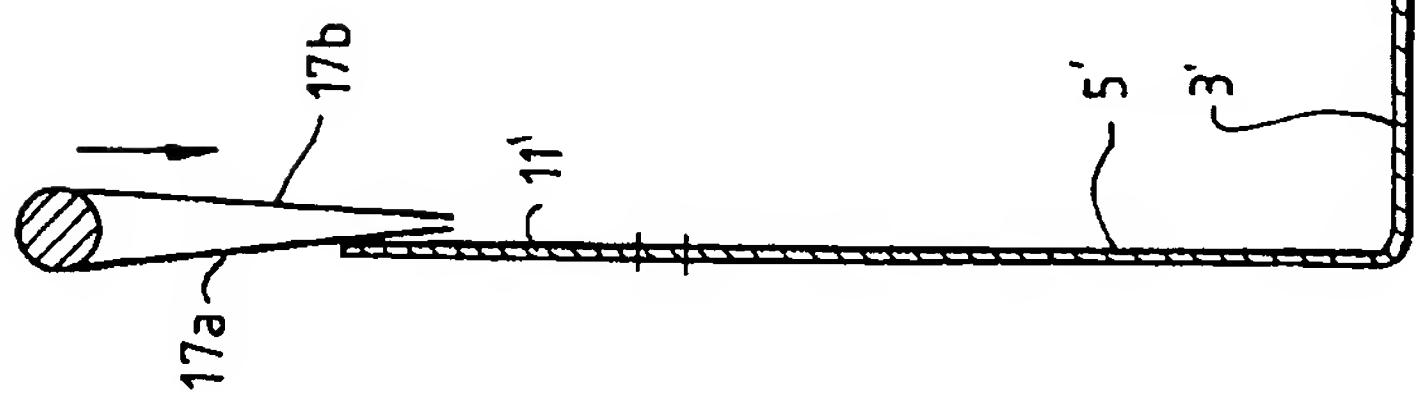
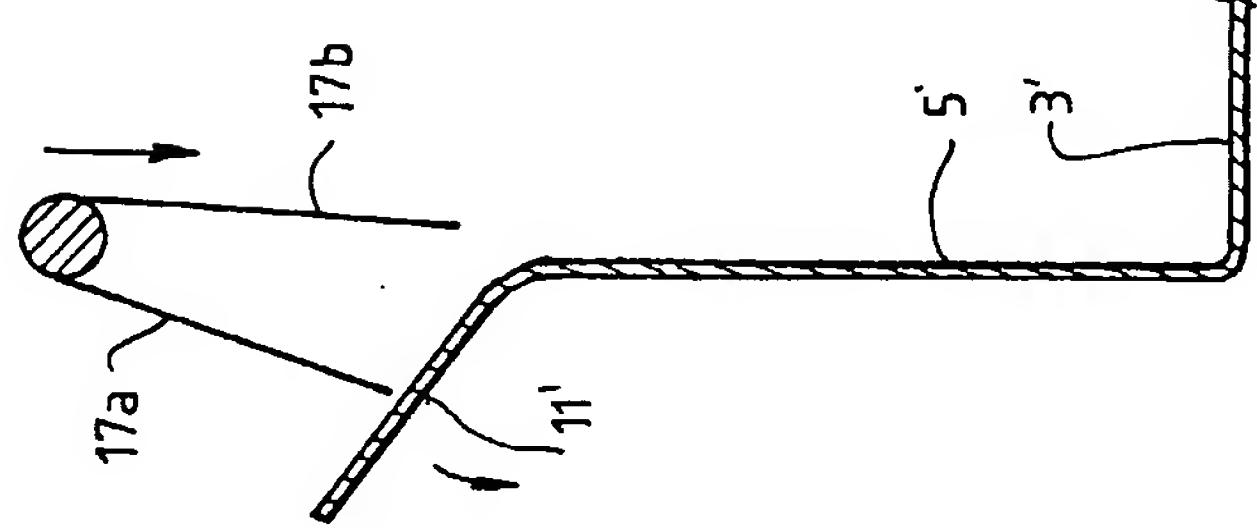
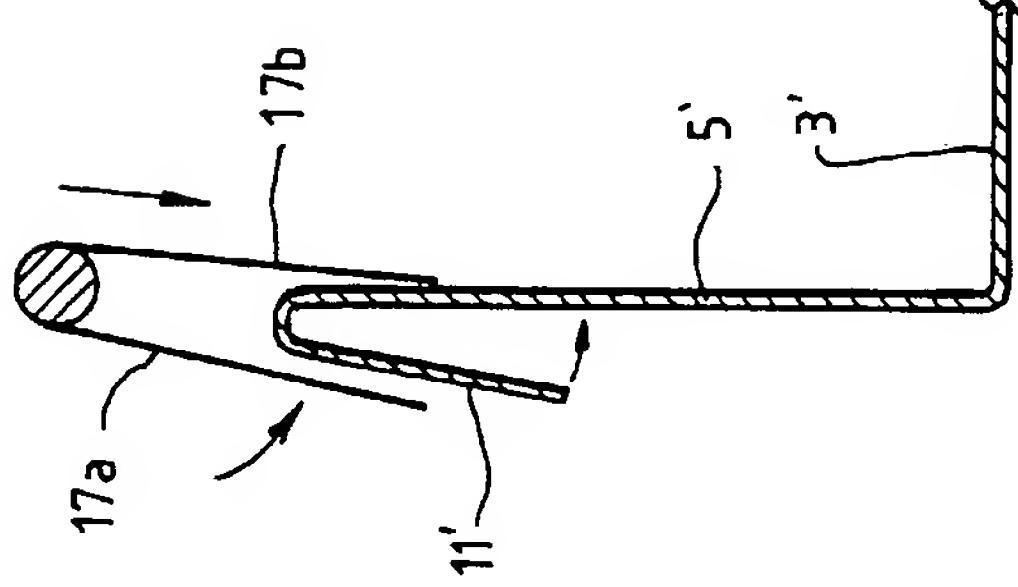
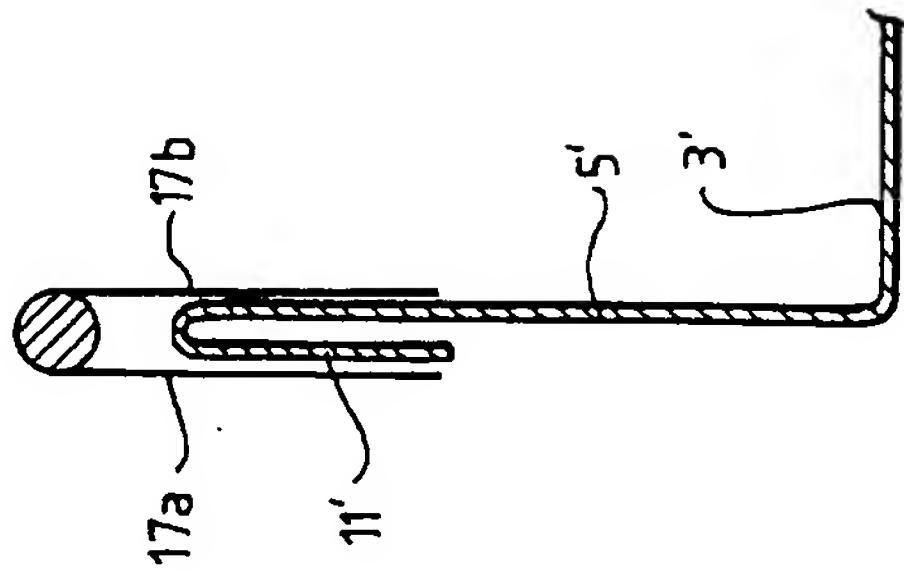
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/00178

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. 7: B65D 5/24, 5/40, 81/34, B31B 1/46, 5/00, A21B 3/13, A47J 37/01		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 18339/92 A (AMCOR LIMITED) 11 March 1993 Whole document - Inherent method disclosed	1-14
Y	Whole document	8-12, 14
X	AU 58140/80 (535237) B (MANIZZA et al) 13 November 1980 Whole document - figures 1-7	1-14
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 7 April 2000		Date of mailing of the international search report 19 APR 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer ADRIANO GIACOBETTI Telephone No : (02) 6283 2579

INTERNATIONAL SEARCH REPORT

International application No. PCT/AU00/00178
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2944719 A (ARNESON) 12 July 1960 Whole document - figures 1-6	1-14
Y	Whole document - figures 1-6	8-12, 14
Y	GB 2158392 A (METAL BOX PLC) 13 November 1985 Whole document - Apparatus to erect a tray-type carton from a blank with gussets	8-12, 14
Y	AU 40375/97 A (NOREN) 19 March 1998 Whole document - Apparatus to erect a flat box blank with gussets	8-12, 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU00/00178

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos :
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See supplemental sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/00178

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: Box II

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-6, 7 and 13 relate to a method of forming a box from a specifically shaped blank comprising three main steps (a), (b) and (c). It is considered that specific steps of the method in association with the features of a particular blank comprises a first "special technical feature".
2. Claims 8-12 and 14 relate to an apparatus, *per se*, for forming a box from a blank which includes a number of stations (without any technical or component features). These stations are characterised by having a functionality or capability to perform the required method step(s) above. The end product is box or container having a specific construction. It is considered that apparatus with a number of stations comprises a second "special technical feature".

These groups of claims are not so linked as to form a single general inventive concept, that is, they do not have any common inventive features, which define a contribution over the prior art. The common concept linking together these groups of claims is the features of the blank and the folded arrangement of the box or container. However this concept is not novel in the light of the cited prior art documents AU 18339/92, AU 58140/80, US 4253602 and US 2944719. Therefore these claims lack unity *a posteriori*.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/00178

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member					
AU	18339/92	NONE						
AU	58140/80	CA	1114791	CH	648801	DE	3017510	
		DK	1995/80	FR	2456040	GB	2048829	
		JP	55-154238	SE	8003379	US	4260098	
US	4253602	AU	59087/80	CA	1137050	DE	3016506	
		DK	2838/80	FR	2460257	GB	2051745	
		IT	1130143	JP	56-013341	MX	150188	
		NL	8002840	SE	8004164	US	4253602	
		ZA	8003293					
US	2944719	NONE						
GB	2158392	AU	41245/85	CA	1235933	DK	1975/85	
		EP	161800	ES	542823	FI	851581	
		GB	2158392	JP	60-240444	NO	851770	
		NZ	211828	PT	80381	SG	116/89	
		US	4636187	ZA	8502770			
AU	40375/97	WO	98/08671	NO	990780	SE	9603121	
END OF ANNEX								